create serious unintended consequences. LNAs can make receiving installations prone to "overload" problems. That is, a strong nearby station (such as an FM broadcast station or amateur radio station) can overload the LNA, such that it does not function for reception of DTV signals. There is also a history of aging-related problems associated with LNAs, such that broader use should not be encouraged. Because they are installed outdoors and subject to many hot/cold cycles over time, many LNAs become unstable and self-oscillate -- basically becoming transmitters -- causing interference to various services, including public safety.[28] The FCC thus could create a significant new enforcement burden for itself by encouraging widespread consumer use of LNAs. Accordingly, tests should not be conducted using LNAs, nor should future predictive models for DTV reception assume that such amplifiers have been installed.

Land Cover and Land Clutter Values Should be Included in Predictive Models. As EchoStar has consistently pointed out, the ILLR does not, in fact, incorporate realistic values for land use and land clutter. This fact is borne out by a comparison between measured and predicted (using Longley-Rice) signal strengths conducted and reported by Anita Longley, *et al.* of the Institute for Telecommunications Sciences. As H&E explains, Ms. Longley reports that there are many cases when the results of the predictive model do not agree with the field measurements: "Some of the differences between predicted and measured median values may be caused by terrain clutter, such as buildings and trees, which has not yet been included in the

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Broadcasters, PBS, and Stallions Satellite and Antenna) ("This [preamplifier] unit should be mounted on the antenna mast about a foot below the main boom of the antenna...") *and* Network Affiliates Comments at Exhibit 1 (Antennacraft Pre-amplifiers are designed to be "mast-mounted;" Blonder-Tongue preamplifiers are designed to "mount on a 1.5 inch O.D. (max) antenna mast....").

[28] *See* Robert D. Weller, "Radio Frequency Interference from Non-Licensed Devices," RF Design, August 1992 (noting that about 6,800 reports of interference from non-licensed devices were found in the FCC's Case Management System database over the period October 1989-February 1992. A number of these reports were ultimately traced to radiating television pre-amplifiers).

prediction models."[29] Ms. Longley later added: "The [Longley-Rice] propagation model calculates transmission loss, with allowances for radio frequency, terrain irregularity, path length, and antenna elevation. Most of the data previously considered [in developing the model] were from open areas, towns and small cities. To this model, we can now add an allowance for the additional attenuation due to urban clutter...."[30] She then described a method for incorporating the effects of clutter, but this method is not incorporated into version 1.2.2 of the ITS Irregular Terrain Model, which underpins ILLR.

H&E observes that while it is possible that some of the data sets used in the development of the Longley-Rice model unavoidably contained clutter, clearly most did not, and the type or degree of such clutter, when present, was not systematically collected or included in the model. Even the Hufford paper cited by the Network Affiliates acknowledges this: "It should then be noted that these data [for the model] were obtained from measurements made with fairly clear foregrounds ... [i]n general, ground cover was sparse . . . ,"[31] which suggests careful site selection to minimize interference from clutter.[32] Indeed, Hufford advises users to "make suitable extra allowances or additions" when employing the model in "urban conditions" or other heavy land-cover situations.[33]

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[29] H&E Reply Statement at 1-2 (quoting A. G. Longley, "Measured and Predicted Long-Term Distributions of Tropospheric Transmission Loss," OT/TRER Report No. 16, July 1971, at 5) (internal quotation marks omitted).

[30] H&E Reply Statement at 2 (quoting A. G. Longley, "Radio Propagation in Urban Areas," OT Report 78-144, p. 31, April 1978).

[31] G.A. Hufford , "A Guide to the Use of the ITS Irregular Terrain Model in the Area prediction Mode," NTIA report 82-100, p.12, Apr. 1982, *quoted in* Network Affiliates Comments at 45.

[32] H&E Reply Statement at 1.

[33] Hufford, *supra*, at 12.

As every television viewer knows, buildings, trees, and other types of land clutter can interfere with a viewer's receipt of television transmissions. Accordingly, continued failure to account for the effects of land clutter in the ILLR model is simply wrong, and ensures that multitudes of consumers will be consigned to inadequate DTV signal reception.

Downlead Line Losses. The broadcasters attack the Commission's planning factors for downlead line losses as being too "conservative."[34] On the contrary, H&E has discovered a number of deficiencies in the Commission's downlead line loss factors. They lead to the conclusion that, if anything, the factors are inadequate. For example, the Network Affiliates erroneously infer, based upon review of one product from a single manufacturer, that Type RG-6 coaxial cable is subject to particular defined levels of loss lower than the Commission's planning factors.[35] H&E reports that in fact, this is not the case: as there are reports of material variation among the different RG-6 products made by various manufacturers, suggesting that the loss levels can in fact be higher than the planning factors.[36] Moreover, it is not necessarily realistic to assume that most consumers will even use RG-6 cable. Budget-conscious consumers will likely favor a less expensive alternative is available that is subject to even greater losses.[37] Finally, a number of other sources of loss, including "balun loss," "splitter" loss and losses due to "impedance mismatch," are not accounted for at all.[38] It follows that the Commission's planning factor values for downlead line losses, which account only for

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[34] Network Affiliates' Comments at 17.

[35] See Network Affiliates' Comments at 17.

[36] See H&E Reply Statement at 2.

[37] *Id.*

[38] *See id.* at 2-3.

cable losses, are inadequate and should be increased. Certainly, H&E's findings demonstrate that there is no basis for reducing downlead line loss factors, as the broadcasters suggest.

Use of Separate VHF and UHF Antennas. In determining the relevant figures for ascertaining the gain of typical consumer antennas, the broadcasters suggest the use of separate VHF and UHF antennas. Although, from a purely technical standpoint, the use of separate antennas for each band can result in improved receiving system performance, H&E reports that the use of separate antennas is atypical and unrealistic. The evidence is that consumers prefer combination antennas.[39] Not only do manufacturers appear to offer more combination antennas than VHF-only or UHF-only (doubtless a reflection of consumer preferences), but the added cost and technical complexities associated with separate antennas also make such a choice an unlikely one for consumers. Moreover, most, if not all, modern television receivers (including many of the most popular DTV receivers) lack the ability to switch between separate VHF and UHF antennas. This necessitates the installation of some external means of switching between the two antennas or combining in order to use separate antennas. This additional equipment adds to the cost and complexity of the receiving installation, and may be beyond the technical capability of some consumers.[40]

III. THE BROADCASTERS' GRATUITOUS ATTACKS ON THE INTEGRITY OF THE DBS INDUSTRY, AND ECHOSTAR IN PARTICULAR, ARE IRRELEVANT TO THIS INQUIRY

As noted above, this inquiry is about whether to make changes to the digital strength standards and testing procedures, and whether to introduce a predictive model, taking into account the statutory criteria spelled out in Section 339(c)(1) of the Communications Act.

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[39] *See id.* at 3-4.

[40] *See id.* at 4.

Accordingly, the Commission should focus on the statutorily mandated inquiry rather than extraneous factors such as the integrity of DBS industry. The broadcasters' gratuitous attacks in this regard are completely irrelevant to the inquiry at hand.

One of these extraneous points needs to be addressed, however. The NAB refers to certain comments by EchoStar's chairman and to comments made during the proposed merger of EchoStar and DTV regarding the relatively small number of local-into-local markets that can be served with high-definition ("HD") local stations and compares them to the 155 local markets in which EchoStar currently provides local-into-local service.[41] The NAB cites this as a reason to be skeptical about EchoStar's claims about how "*difficult (or uneconomical) it would be to* offer digital local-into-local in a large number of markets."[42] In addition to all the other flaws of the NAB's argument, this evidences a complete failure to understand the substantial differences between the carriage of local stations in standard definition ("SD"), which is what EchoStar currently does with respect to local analog stations, and carriage in HD (which was what Mr. Ergen was talking about in the passage quoted). The economics of providing HD locals is very different from the economics of providing analog locals in SD, in view of the vastly greater bandwidth required to retransmit HD signals. Thus, the fact that EchoStar today offers SD locals service in 155 markets proves nothing whatsoever about the economics of offering HD locals.

In fact, contrary to the NAB's dark intimations, EchoStar has been striving to increase the availability of over-the-air HD broadcasting to consumers. EchoStar's receivers have built-in tuners designed to receive over-the-air broadcast signals and to integrate them with its satellite television service. In fact, H&E reports that the performance of EchoStar's built-in over-the-air tuner compares favorably with the performance of the digital receivers available

[41] NAB Comments at 12 n.14.

[42] *Id.*

today.[43] EchoStar's set-top boxes are also programmed to recognize when a digital signal is being received over the air and to include the program information about these channels in EchoStar's electronic program guide.

IV. CONCLUSION

EchoStar urges the Commission to take the above reply comments and the H&E Reply Statement into account in formulating its report and recommendations to Congress.

Respectfully submitted,

/s/

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July 5, 2005

[43] H&E Reply Statement at 7.

ATTACHMENT A

Reply Statement of Hammett & Edison, Inc.

Consulting Engineers

EchoStar Satellite L.L.C. • Englewood, Colorado

Statement of Hammett & Edison, Inc., Consulting Engineers

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by EchoStar Satellite L.L.C. to prepare an engineering statement in support of its Reply Comments to the FCC's Notice of Inquiry in ET Docket No. 05-182, "Technical Standards for Satellite-Delivered Network Signals."[1]

Background

In its Notice of Inquiry in ET Docket No. 05-182 ("NOI"), the Commission seeks, among other things, information and comment on current regulations that identify households that are unserved by local analog broadcast television stations in order to determine if the regulations may be accurately applied to local digital broadcast stations for the same purpose. Hammett & Edison, Inc. prepared an engineering statement and associated figures, dated June 17, 2005, in support of the initial comments of EchoStar Satellite L.L.C. to that NOI. This statement considers some of the comments filed by others.

Clutter is Not Included in the Longley-Rice Model

The Joint Network Affiliates have contended that the Longley-Rice propagation model upon which ILLR is based already incorporates relevant clutter data.[2] [3] However, their position is inconsistent with the citation that they offer as justification. At page 45, the Joint Networks quote from Hufford,[4] "It should then be noted that these data were obtained from measurements made with fairly clear foregrounds ... [i]n general, ground cover was sparse...." (emphasis added) Fairly clear foregrounds and sparse ground cover are indicative of careful site selection, which is meant to minimize the effects of clutter.

As EchoStar has repeatedly pointed out, the Longley-Rice model does not incorporate land use and land cover (clutter) in any systematic or relevant way. A comparison between measured and predicted (using Longley-Rice) signal strengths was conducted and reported by Anita Longley, *et al.* of the Institute for Telecommunications Sciences.[5] As the report's principal author, Ms. Longley notes that there are many cases when the results of the predictive model do not agree with the field measurements. At page 5, she writes, "Some of the differences between predicted and measured median values may be caused by terrain clutter, such as buildings and trees, which has not yet been

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1 FCC 05-94, adopted April 29, 2005.

2 Joint Comments of the ABC, CBS, and NBC Television Affiliate Associations to ET Docket No. 05-182, pp. viii, 45, June 17, 2005.

3 Joint Comments of the ABC, CBS, Fox, and NBC Television Network Affiliate Associations to ET Docket No. 00-11, p. vii, February 22, 2000.

4 G.A. Hufford, "A Guide to the Use of the ITS Irregular Terrain Model in the Area prediction Mode," NTIA Report 82-100, p. 12, Apr. 1982.

5 A. G. Longley, "Measured and Predicted Long-Term Distributions of Tropospheric Transmission Loss," OT/TRER Report No. 16, July 1971.

included in the prediction models." (emphasis added) In 1978, she wrote, "The [Longley-Rice] propagation model calculates transmission loss, with allowances for radio frequency, terrain irregularity, path length, and antenna elevation. Most of the data previously considered [in developing the model] were from open areas, towns and small cities. To this model, we can now add an allowance for the additional attenuation due to urban clutter...."[6] (emphasis added) She then describes a method for incorporating the effects of clutter, but this method is not incorporated into version 1.2.2 of the ITS Irregular Terrain Model, which underpins ILLR.

While we agree that some of the data sets used in the development of the Longley-Rice model unavoidably contained clutter, most did not, and the type or degree of such clutter, when present, was not systematically collected or included in the model. Until better data are available, there is no justification for eliminating the ILLR clutter factors.

Downlead Line Losses Not Conservative

Based upon a review of one product from a single manufacturer (Channelmaster Pro Install), the Joint Networks infer that fifty feet of Type RG-6 coaxial cables have losses of less than 1 dB at low-band VHF channels, less than 2 dB at high-band VHF channels and less than 3 dB at UHF channels 14–51. The maximum loss at UHF is given as 2.76 dB. In fact, however, there is some variation in the loss of RG-6 cable. For example, Belden Cable[7] lists a loss of 3.3 dB at Channel 51 for its Model 1152A Type RG-6 cable. A 1979 study conducted by the NTIA[8] found a range of 2.7–4.3 dB for various models of dry Type RG-6 cable at Channel 51. In addition, not all consumers will use Type RG-6 cable. Type RG-59 cable is less expensive than Type RG-6 cable, and may be selected by price-conscious consumers; NTIA reports that this cable has losses of 3.5–6 dB. Aging of the downlead cable or water in it, regardless of type, would further increase its loss.

In addition to the attenuation (loss) of the cable itself, there are generally other losses in the downlead system between the antenna and the television set. Most television antennas are designed with an operating impedance of about 300 ohms, while Type RG-6 cables and television receivers are designed with an operating impedance of 75 ohms. The conversion between these two impedance values is typically accomplished at the antenna using a device called a "balun."[9] Baluns have loss associated

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6 A. G. Longley, "Radio Propagation in Urban Areas," OT Report 78-144, p. 31, April 1978.

7 http://bwccat.belden.com/ecat/pdf/1152A.pdf

8 R.G. FitzGerrel, *et al.*, "Television Receiving Antenna System Component Measurements," NTIA Report No. 79-22, pp. 32–37, June 1979.

9 An abbreviation for BALanced to UNbalanced transformer.

with them, averaging about 0.6 dB at low-band VHF channels, 1.5 dB at high-band VHF channels, and 2.5 dB at UHF channels.[10]

Many households have several television receivers,[11] which may share a common antenna. This sharing is accomplished by the use of a power divider (so-called "splitter"), which allows a single downlead cable to be split into two or more outlets. The minimum loss associated with such splitters is calculated as

$$L_{db} = 10 \log \frac{1}{N}$$

where N is the number of outlets in the splitter. Thus, the two-outlet splitter typically found in many homes, therefore, has a loss of at least 3 dB. Finally, the impedance matches among the antenna, balun, downlead, splitter, and receiver are undoubtedly imperfect. Typical additional losses due to the impedance mismatch have been reported[12] [13] as approximately 2 dB at VHF low-band channels, and 2.5 dB at VHF high-band and UHF channels.

Thus, additional losses associated with a typical consumer downlead system, including balun, splitter, and impedance mismatch total about 5.6 dB at low-band VHF channels, 7 dB at high-band VHF channels, and 8 dB at UHF channels. The corresponding planning factor values of 1, 2, and 4 dB account only for cable losses. Thus, there is therefore considerable justification for increasing the losses assumed to be associated with the downlead system, and there is certainly no justification for reducing them.

Assumed Use of Separate VHF and UHF Antennas Not Appropriate

Both the Joint Networks[14] and NAB[15] suggest that the relevant figures for determining the gain of typical consumer receiving antennas should be taken from separate VHF and UHF antennas. We agree that the use of separate antennas for each band can result in improved receiving system performance, since each antenna can be optimized for its particular range of channels. However, the use of separate antennas is atypical in our experience, and the literature suggests strongly that combination antennas are commonly preferred by consumers.[16] Indeed, most of the product lines referred to by the Joint Networks and NAB show a preponderance of "all channel" antennas. For example, the Winegard

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10 FitzGerrel, *op. cit.*, p. 25.

11 GAO Report GAO-03-7, "Telecommunications: Additional Federal Efforts Could Help Advance Digital Television Transition," released December 2, 2002.

12 Oded Bendov, *et al.*, "DTV Coverage and Service Prediction, Measurement and Performance Indices," Proc. IEEE Broadcast Technology Symposium, 2001.

13 FitzGerrel, *op. cit.*, pp. 29–30.

14 Joint Comments, *op. cit.*, pp. 18–23.

15 Comments of the National Association of Broadcasters to ET Docket 05-182, pp. 21–22, June 17, 2005.

16 *E.g.*, FitzGerrel, *op. cit.*

antenna cut-sheets submitted by NAB list 6 VHF-only antennas, 11 UHF-only antennas, and 16 combination "all channel" antennas, the latter representing nearly half of the total. One would expect that antenna manufacturers would devote the largest portion of their product lines to popular antennas designs, as opposed to specialty antennas. VHF-only and UHF-only antennas are used professionally, for example by cable television headends that seek maximum performance in the reception of a single station. It seems clear, on the other hand, that combination "all channel" antennas are the ones most commonly purchased and used by consumers.

There are also economic penalties and technical difficulties associated with the use of separate VHF and UHF antennas. Obviously, the cost of purchasing two antennas and two downlead cables will generally be greater than purchasing a single all-channel antenna and single downlead cable. Most, if not all, modern television receivers (including all of the DTV receivers we are familiar with) do not have the capability of switching between separate VHF and UHF antennas. So, some external means of switching between the two antennas or combining them together will have to be installed, if separate antennas are to be used. This additional equipment adds to the cost and complexity of the receiving installation, as well as additional downlead system losses, and may be beyond the technical capability of some consumers.

"Fifth-Generation" And Later Receivers Still Have Problems

We agree with NAB that the latest receivers, so-called "fifth generation" designs, do appear to have superior abilities to receive ATSC signals in the presence of certain types of multipath. However, the white noise enhancement penalty associated with the operation of the equalizer in the DTV receiver still remains and must be considered. As previously discussed,[17] the presence of multipath at a receiving site effectively reduces the available strength of the DTV signal at that site because the equalizer in the receiver generates noise in proportion to the degree of multipath. For example, if there is 3 dB of white noise enhancement, then a receiver that had a 15.2 dB noise threshold under ideal conditions (*i.e.*, no multipath) will have a 18.2 dB noise threshold under the multipath condition. This 3 dB increase is equivalent to a halving of the transmitter power of the DTV station. NAB presents data,[18] which shows that fifth generation receiver performance under some static multipath conditions requires 3–4 dB of additional signal to overcome the white noise penalty. Since white noise enhancement can be substantial at sites having severe multipath, it is important that this parameter be measured and subtracted from the nominal measured field strength in any field test.

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17 Comments of EchoStar, to ET Docket 05-182, Engineering Statement, p. 8.

18 NAB comments, *op. cit.*, Table 12 at p. 41.

Equally important difficulties associated with producing a usable DTV picture under dynamic (as opposed to static) multipath conditions remain largely unaddressed in the fifth generation designs, which may account for the continuing failure to receive about 10% of signals under empirical conditions.[19] Further, improvements in the performance of the fifth generation demodulators do nothing to improve the performance of other components in the DTV receiver. Specifically, the performance of the tuners in consumer DTV receivers has been criticized as limiting DTV reception in the presence of otherwise adequate signal levels.[20] While these DTV tuner problems are largely associated with the presence of strong interfering signals, there may be impacts at many locations on consumer reception of network signals.

Consumers also have no knowledge of what "generation" DTV receiver they are purchasing. The "generational" association is largely a consumer electronics industry distinction, which has not been communicated to the consumer. Indeed, despite our inspection of its internal components, we were unable to determine the "generation" of one of the receivers that we recently tested, and so tried to obtain that information from the manufacturer. The manufacturer flatly refused, stating that, "[it] does not supply any information about the design or components of its consumer retail products." Unless the consumer is given information concerning the performance of his DTV receiver, as CEA is apparently attempting to do in the case of antennas with its "antenna labeling program,"[21] the advantages of the latest technological developments may be lost on the consumer, who can be expected to seek the product having the lowest cost.

FCC Planning Factors Were Intended Primarily For Channel Allotments

The planning factors for DTV used by the FCC were adopted years before any consumer DTV receivers were available. They were adopted, in part, in order that a Table of DTV Channel Allotments might be developed, which assigned a second channel to each analog TV station in the U.S. Some of the assumptions underlying these factors would be inappropriate in this context, as marketplace experience has been gained. For example, the FCC assumed different receiving antenna patterns for NTSC and DTV.[22] The counter-intuitive assumption resulting from that decision was that consumers would install better-performing antennas for DTV use. In fact, a more reasonable assumption for the purpose of assessing consumer reception is that they will not.

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19 Tim Laud, *et al.*, "Performance of 5th Generation 8-VSB Receivers," IEEE Trans. Consumer Electronics, Vol. 50, No. 4, November 2004.

20 Charles W. Rhodes, "Interference Between Television Signals Due to Intermodulation in Receiver Front-ends," Proc. IEEE Broadcast Technology Symposium, 2004.

21 Joint Comments, p. 21.

22 See H&E Petition for Reconsideration in MM Docket No. 87-268, filed June 13, 1997.

The specified 28 dBu minimum field strength required for DTV reception at VHF low-band has also been criticized as being sorely inadequate,[23] due in large part to an inadequate consideration of man-made noise at those channels. Additionally, the planning factors assumed that interference from DTV stations operating on other than co- and adjacent-channels would not exist. This assumption was based upon the performance of a dual-conversion prototype DTV receiver. However, most if not all consumer DTV receivers are single-conversion, meaning that they are far more susceptible to interference from some so-called "taboo channels." Now that several generations of consumer DTV receivers are available, it would be appropriate for the Commission to consider using more empirically tested planning factors in this proceeding, since they more accurately reflect the consumer's ability to actually receive a DTV picture.

Time Variability of DTV Signal

None of the other commenters in this proceeding appears to mention that a correction is needed to account for the variation over time of the DTV signal. The FCC's criterion for DTV coverage is a specified threshold field strength with 50% confidence, 90% of the time, that is, a situational variability factor of 50% and a time variability factor of 90%, commonly written as F(50,90). As previously mentioned, a single set of cluster measurements cannot adequately characterize the time variability to provide reasonable assurance that the DTV signal will be available 90% of the time. So, a 90% time (or greater) reliability factor should be applied to the assumed median value obtained during the cluster measurements to adjust the assumed "typical" measured field strength to a 90% time value.

Additional Data on Variability Among Consumer DTV Receivers.

Tests on an additional DTV receiver, Dish Model DP942, have been completed since our June 17, 2005, statement was prepared. For completeness, data on all six DTV receivers (five consumer and one professional model) are presented here for comparison with the FCC's planning factors, as follows:

1. LG LST-4200A
2. Samsung SIR-T451
3. Motorola HDT101
4. Dish DP942
5. RCA DTC100
6. Zenith DTVDEMOD-S

[23] Victor Tawil and Charles Einolf, Jr., "Impact of Impulse Noise on DTV Reception at Low VHF," Proc. IEEE Broadcast Technology Symposium, 2004.

Receivers 1, 2, 3, and 4 were obtained from retail vendors in May 2005. Receiver 5 is an older model, purchased in 2000. All of the consumer receivers are set-top boxes in the under $300 price range.[24] Receiver 6 is a professional ATSC demodulator, which provides detailed information concerning equalizer performance, error rate, and other parameters.

The receivers were set up at a location (Alameda, California) having favorable path characteristics for DTV reception; that is, relatively constant signal levels, and multipath components having minimal amplitude and short delay. The receivers were connected to a common antenna and attenuation was added in 1 dB steps until visible failure of DTV reception occurred. The measurements show the differences in sensitivity of the receivers under favorable field conditions. The estimated margin of error for these measurements was ±1.5 dB.

	Measured Sensitivity by Channel, dBm						
Receiver	D12	D23	D29	D41	D43	D47	D49
1	-81.9	-82.6	-84.1	-82.8	-80.4	-81.1	-81.8
2	-80.9	-80.6	-83.1	-80.8	-81.4	-81.1	-82.8
3	-78.9	-83.6	-83.1	-83.8	-83.4	-82.1	-82.8
4	-81.7	-82.9	-84.1	-82.9	-82.8	-81.5	-81.9
5	-75.9	-78.6	-82.1	-77.8	-77.4	-78.1	-78.8
6	-75.9	-78.6	-79.1	-77.8	-79.4	-79.1	-79.8
Variation in Sensitivity, RX1–5	5.8 dB	5.0 dB	5.0 dB	6.0 dB	6.0 dB	4.0 dB	4.0 dB
Average Sensitivity, dBm, RX 1–5	-79.9	-81.7	-83.3	-81.6	-81.1	-80.8	-81.6
FCC PF, dBm	-81.2	-84.2	-84.2	-84.2	-84.2	-84.2	-84.2

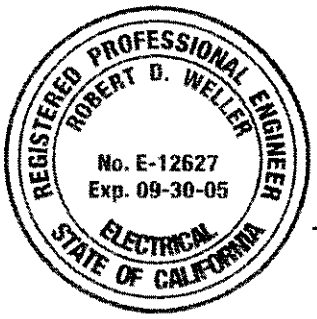
The above results show that consumer receivers can differ in sensitivity by 2–6 dB under favorable field conditions.

After compensating for the white noise enhancement of the equalizer (typically 0.2 dB), which was taken from Receiver 5 and assumed to apply to all of the other receivers, the sensitivities can also be compared with the FCC planning factor ("PF") values of -81.2 dBm at VHF and -84.2 dBm at UHF. Depending upon the channel involved, some receivers were up to 6.8 dB less sensitive than the planning factors specify. Considering all channels, the typical receiver was 2.4 dB less sensitive than the FCC planning factors.

Bear in mind that this sensitivity field test was intended to minimize, but not eliminate, the generational differences between the 8-VSB demodulators within the various receivers. During testing, it was clear that the oldest receiver (#5) had difficulties with adjacent-channel interference. Specifically, the DTV Channel D43 had a collocated NTSC facility on Channel N44, and DTV Channel

[24] The Dish unit includes a satellite receiver and digital video recorder, and is provided to subscribers free of charge when ordered with certain service tiers.

D49 had a collocated NTSC facility on Channel N48, which also affected reception on Channel D47. All of the receivers tested showed improvement over this "first-generation" model.



Robert D. Weller
Robert D. Weller, P.E.

July 5, 2005

Before the
Federal Communications Commission
Washington, D.C. 20554

In Re Technical Standards for Determining	)	
Eligibility for Satellite-Delivered Network	)	**ET Docket No. 05-182**
Signals Pursuant to the Satellite Home	)	
Viewer Extension and Reauthorization Act	)	

REPLY COMMENTS OF THE NATIONAL ASSOCIATION OF BROADCASTERS

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July 5, 2005

TABLE OF CONTENTS

The National Association of Broadcasters ("NAB") hereby files its reply comments in response to the Notice of Inquiry ("Notice") released by the Commission on May 3, 2005, in the above-referenced proceeding.[1/]

Introduction and Summary

As NAB explained in its initial comments, Congress' goal in the Satellite Home Viewer Extension and Reauthorization Act ("SHVERA") was to promote *local-to-local* satellite delivery of TV station signals -- both analog and digital -- and to minimize and phase out delivery of *distant* signals by satellite carriers. DIRECTV's plan to offer digital local-to-local service *this year* to 45% of U.S. television households, and by 2007 to deliver as many as 1,500 local digital signals by satellite, is fully consistent with this objective. DIRECTV's Comments confirm that, because of the "if local, no distant" provisions of SHVERA, the distant signal license will become irrelevant to DIRECTV within the next few years. DIRECTV Comments at 1-2.

EchoStar, by contrast, has to date announced few plans for offering digital local-to-local service. Rather, EchoStar appears to be intent on, wherever possible, using national digital feeds (from New York and Los Angeles) as a low-cost substitute for local-to-local service. *See* NAB Comments at 11-12 (quoting EchoStar CEO Charles Ergen on economic advantages of national feeds).

Consistent with this apparent business plan, EchoStar's Comments consist of a litany of technical arguments designed to increase -- massively -- the number of households that will be deemed "unserved" over-the-air by digital signals of network stations. *See* EchoStar Comments at 3-11. EchoStar's technical arguments are self-serving -- and wrong. The Commission should

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1/ NAB is a nonprofit, incorporated association of radio and television broadcast stations that serves and represents the American broadcast industry.

not allow EchoStar to exploit this proceeding to advance a business plan that is contrary to the expressed will of Congress to promote local-to-local service.

A second "lens" through which EchoStar's Comments should be filtered is the double standard it inexplicably proposes to apply to broadcast signals on the one hand, and to its own signals on the other hand. For example:

- EchoStar proposes to treat households as "unserved" over the air unless they can receive local TV stations with an indoor antenna -- even though DBS would be doomed if it were forced to rely on indoor antennas;

- EchoStar insists that if outdoor antennas are used to test over-the-air signals, they be pointed in the wrong direction -- even though mispointing would likewise be fatal for DBS;

- EchoStar asks the Commission to impose extraordinarily high performance standards on broadcasters -- even though DBS service is subject to "rain fade" and is unavailable if anything at all (whether a house or a tree branch) blocks a satellite dish's direct line of sight to the satellite.

A third theme common to virtually all of EchoStar's arguments is that they ignore, and often contradict, the Commission's detailed plans for the analog-to-digital transition. EchoStar's bid to impose a "99% time variability" requirement on broadcasters for purposes of SHVERA, or vastly to increase the minimum field strengths required for a location to be "served," for example, would punish stations for *obeying the Commission's rules governing the transition.* That is, to comply with EchoStar's proposals, stations would need to commit gross violations of the Commission's limits on effective radiated power ("ERP") for digital signals.

The Commission's present task is to prepare a report to Congress about measurement and prediction of digital signal reception. Regulations based on EchoStar's proposals, however,

would both be contrary to the express intent of Congress and arbitrarily depart from the assumptions that underlie the digital transition. The Commission should instead make recommendations to Congress that will promote local-to-local service and discourage abuse of the distant-signal license.

I. TESTING BASED ON INDOOR ANTENNAS WOULD BE ARBITRARY AND CAPRICIOUS

EchoStar argues that site testing of digital signals should be done either with an indoor antenna or by subtracting 9 dB (or more) from the field strength measured outdoors at rooftop height. EchoStar Comments at 3, 6-7; *see* Hammett & Edison ("H&E") Statement at 3-4. This suggestion is unfair and inconsistent with the fundamental assumptions of the DTV transition, and would be an abuse of discretion if implemented by regulation.

EchoStar and its engineers acknowledge that indoor antenna performance is usually much inferior to that of a rooftop antenna. *E.g.*, H&E Comments at 3-4. Yet as EchoStar and H&E are well aware, *satellite* antennas ("dishes") *do not work at all* indoors. EchoStar and H&E provide no explanation for the gross unfairness of assuming that the same household that uses an *outdoor* antenna to receive DBS signals will use an *indoor* antenna to receive over-the-air signals. *See* Reply Engineering Statement of Meintel Sgrignoli & Wallace, ¶¶ 12-13 ("MSW Reply Engineering Statement").

Nor do EchoStar or its engineers explain why TV stations, which are in full compliance with the Commission's Orders concerning buildout and operation of their digital channels, should now forfeit large portions of their exclusive service areas. If the Commission had intended for consumers at the outer reaches of station coverage areas to use *indoor* antennas, it would have developed an entirely different channel allocation plan. Having instead premised the DTV transition on *outdoor* antennas, the Commission cannot now penalize broadcasters for doing

precisely what the Commission asked them to do. Indeed, were stations to comply with EchoStar's new standard by transmitting their DTV signals at power levels sufficient to reach indoor antennas 50 or 60 miles away, they would be in violation of the Commission's rules limiting ERP to prevent interference. The Commission should therefore reject EchoStar's proposal.

II. ECHOSTAR'S ARGUMENTS FOR ASSUMING AN INCORRECTLY-ORIENTED OUTDOOR ANTENNA ARE LIKEWISE WITHOUT MERIT

EchoStar also argues that the Commission should assume that outdoor over-the-air antennas are incorrectly oriented. EchoStar Comments at 3, 4-5, 7-8. Again, EchoStar fails to explain why such a rule should apply to broadcast signals when, if it were applied to EchoStar, its subscribers would receive no service at all. Nor does EchoStar even attempt to explain why it would be fair -- or good policy -- suddenly to assume use of an incorrectly-oriented antenna when the entire DTV transition has been premised on use of a properly-oriented rooftop antenna.

As discussed in NAB's initial Comments, in the SHVERA Congress sought to promote *local-to-local* digital service and to phase out all types of *distant* network stations. As Congress hoped, DIRECTV is planning a rapid rollout of digital local-to-local. DIRECTV Comments at 1-2. Thus, not only would assumption of a "mispointed" antenna (EchoStar Comments at 8) violate the assumptions behind the DTV transition, it would encourage use of the *undesirable* method of delivering digital signals -- namely, via distant stations from New York or Los Angeles.

EchoStar's engineers attempt to support this ill-advised suggestion by describing the results of a TIREM prediction of analog reception at 4.4 million "calculation points" in the United States. H&E Statement at 3. For several reasons, however, this study does not support EchoStar's proposal that the Commission should assume that antennas are improperly oriented.

First, as discussed in detail in the initial Engineering Statement of Meintel, Sgrignoli & Wallace in this proceeding, even if local TV station transmitters are situated in different directions, consumers can easily obtain rotors for their antennas -- and the Commission has always assumed use of such rotors in appropriate circumstances. MSW Statement, ¶¶ 43-45. In addition, in areas with transmitting towers in different locations, local installers often offer special, non-rotating antennas that point correctly at all of the local stations. *Id.*, ¶ 44.

Second, the TIREM study done by H&E sheds little light on the extent to which consumers can obtain their local network stations with a *fixed* antenna. For one thing, H&E does not appear to have made any effort to focus its study on where consumers actually *live*. Since the U.S. population is heavily concentrated in and around cities, and much of the land mass of the United States (such as the states of Nevada and Wyoming) is thinly populated, H&E's analysis is meaningless. *See* MSW Reply Engineering Study, ¶ 11 (percentage of *population* served is much higher than percentage of *land mass* served for 10 typical stations). The H&E study also ignores that, in many cases, whether certain stations' transmitters are located in different directions is *irrelevant* as a practical matter. (As H&E admit, some households are predicted to receive as many as 38 Grade B intensity signals over the air. H&E Statement at 3.) A consumer in Baltimore, for example, where the local Big-4 affiliate stations all have co-located towers, has no need to reorient her rooftop antenna in the direction of the ABC, CBS, Fox, and NBC stations in Washington, D.C. *See* MSW Reply Engineering Statement, ¶ 8.

Finally, the study done by Meintel Sgrignoli & Wallace looks at co-location of DTV towers in those markets that have a full complement of Big-4 affiliates (ABC, CBS, Fox, and NBC). MSW Statement, ¶ 44. As that study demonstrated, co-location of digital transmitters is the rule, not the exception. *Id.*

EchoStar's engineers assert that only 10-15% of outdoor antennas use a rotor. H&E Statement at 2. Even assuming that statistic was correct, it may simply reflect one or more of the following: (1) there is no need for an antenna rotor at the household because the local TV stations are co-located, (2) the household is in an area with strong signal strength and can rely on a nondirectional rooftop antenna, or (3) the household has a special antenna oriented towards two different sets of transmitters. In any event, since rotors are readily available at modest expense, there is no basis for breaking with the Commission's longstanding assumption that a household's rooftop antenna is properly oriented. *See, e.g., In Re Technical Standards for Determining Eligibility for Satellite-Delivered Network Signals Pursuant to the Satellite Home Viewer Improvement Act*, ¶ 38, ET Docket No. 00-90 (released Nov. 29, 2000) ("SHVIA requires . . . use of an antenna properly oriented towards the local network stations(s) at issue.").

H&E's suggestion (at 4) that in conducting site tests, engineers should orient the measurement antenna "in the same direction as other antennas in the area," violates the Commission's bedrock assumption of correct antenna orientation, which is universally recognized to be good engineering practice. It is also completely impractical. If, as will often be the case, nearby antennas are oriented in different directions, or if some consumers (who now subscribe to cable or DBS) have long-unused antennas on their roofs that are pointed in random directions, there will be no objective method for determining how "other antennas in the area" are pointed. In addition, if the DTV towers of nearby stations are not in the same location as the station's analog transmitters, the analysis will be still more confused. *See* MSW Reply Engineering Statement, ¶ 17.

III. ADOPTION OF ECHOSTAR'S PROPOSAL FOR A "99%" STANDARD WOULD BE CONTRARY TO THE ASSUMPTIONS BEHIND THE COMMISSION'S DTV PLANNING FACTORS

In connection with both site testing and Longley-Rice predictions, EchoStar urges treating households as unserved unless they are expected to receive, at least 99% of the time, a signal above the minimum field strengths set forth in 47 C.F.R. § 47.622(e)(1). EchoStar Comments at 9 (predictions); H&E Statement at 7 (testing), 11 (predictions). Although EchoStar acknowledges that the Commission's DTV planning factors are based on the assumption of service at least ***90%*** of the time, it advocates shrinking station's coverage areas by imposing a much higher time variability factor (***99%***) on TV stations for purposes of determining eligibility to receive a distant signal. *Id.*[2/] While advocating this radical change for broadcasters, EchoStar does not offer any data on the extent to which its *own* reliability is affected by factors such as rain fade or blockage by foliage.

As with the other suggestions discussed above -- indoor antennas and badly-oriented outdoor antennas -- EchoStar's "99%" proposal amounts to changing the rules in the middle of the game. If the Commission expected stations to be able to achieve a 99% time variability factor, it would not have "define[d] DTV service areas on the basis of stations' noise-limited F(50,90) contour." Notice of Inquiry, ¶ 10. Because of this definition, stations could not possibly -- without egregiously violating the Commission's rules -- meet a 99% time variability test in the outer portions of their DTV service areas. Punishing stations that have fully complied

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2/ There appears to be no dispute among the commenters that the Act does not now permit a DBS company to sign up a subscriber for a distant digital signal based on a *prediction* about over-the-air digital signal strength. NAB Comments at 3-4. Rather, under the Act, only an actual *site test* can establish that a household is "digitally unserved." While the Commission should work on developing a digital predictive model for (possible) use after the DTV transition is complete, there are, very serious practical problems with implementing a "digital ILLR" model in the short term. *Id.* at 33-38.

with the Commission's transition plan by allowing EchoStar to invade these areas with duplicative programming on digital signals from New York or Los Angeles would be arbitrary and capricious.

IV. ALTERATION OF THE SIGNAL STRENGTH LEVELS SET FORTH IN SECTION 73.622(e)(1) OF THE COMMISSION'S RULES FOR PURPOSES OF SHVERA TESTING IS UNNECESSARY AND CANNOT BE DONE BY REGULATION

For purposes of site tests of digital field strength, EchoStar urges that the minimum field strengths set forth in Section 47 C.F.R. § 73.622(e)(1) of the Commission's rules be increased by several dB. As discussed below, the Commission could not make such a change itself, because the SHVERA codifies, by statute, the minimum signal strengths that define which households are digitally "served" or "unserved." Moreover, even if EchoStar were correct about the time variability issue, the DTV planning factors already contain a substantial "safety factor" that makes such an adjustment unnecessary, particularly if a household uses a preamplifier to improve its reception – which the Commission recommends if the household is in an area of relatively low signal strength.

First, the Commission itself could not by regulation increase the signal strengths that qualify a household as "served," because to do so would be contrary to the express dictates of the Act. To ensure against any expansion of the scope of the new compulsory license based on testing of over-the-air digital signals, Congress *locked in* the specific dBu levels currently set forth in Section 73.622(e)(1) of the Commission's rules. *See* 47 U.S.C. § 339(a)(2)(D)(vi)(I) (subscriber is eligible for a distant signal "if such subscriber is determined . . . not to be able to receive a signal that exceeds the signal intensity standard in section 73.622(e)(1) of title 47, Code of Federal Regulations, **as in effect on the date of enactment of the Satellite Home Viewer Extension and Reauthorization Act of 2004**") (emphasis added). For example, since the

minimum signal strength for a UHF digital signal is 41 dBu under Section 73.622(e)(1), the Commission could not declare a household to be unserved if it is measured to have a signal strength of 45 dBu for a nearby UHF station.

Second, because the Commission's planning factors for DTV service are already very conservative, there would be no justification for increasing, still further, the minimum signal strength that defines a household as "served" by a digital TV signal. The following are just a few of the ways in which the DTV planning factors *over*estimate the signal strength that must be available for a household to be able to receive digital TV signals:

- real-world UHF antennas (such as the Channel Master 4228) have gains that substantially exceed those assumed in the planning factors (*see* MSW Engineering Statement, ¶ 45-46);
- readily-available brands of coaxial cable have lower losses than those assumed in the planning factors (*see id.*, ¶ 53); and
- low-noise amplifiers can, at modest cost, offer a household 15, 20, or more dB better than the DTV planning factors assume (*see id.*, ¶¶ 49-51).

Unless the Commission is prepared to adjust the planning factors to take into account these factors -- which would *expand* stations' coverage areas -- it cannot consider implementing EchoStar's proposals to *shrink* stations' coverage areas by adding an additional time variability factor.[3/]

[3/] Although Hammett & Edison state that they have "collected temporal data on the amplitudes of fourteen DTV signals," H&E Statement at 6, they disclose the results of only *six* of these 14 tests. *See* H&E Statement at 6 ("*Some* of the temporal data are shown in Figure 1.") (emphasis added); *id.*, Figures 1A-1C (showing results for six stations). Because H&E offers no explanation for its decision not to disclose the results of 57% of its "temporal data" tests, the Commission should not rely on the results that H&E selectively chose to disclose.